Planets And Life The Emerging Science Of Astrobiology

In Cosmic Biology, Louis Irwin and Dirk Schulze-Makuch guide readers through the range of planetary habitats found in our Solar System and those likely to be found throughout the universe. Based on our current knowledge of chemistry, energy, and evolutionary tendencies, the authors envision a variety of possible life forms. These range from the familiar species found on Earth to increasingly exotic examples possible under the different conditions of other planets and their satellites. Discussions of the great variety of life forms that could evolve in these diverse environments have become particularly relevant in recent years with the discovery of around 300 exoplanets in orbit around other stars and the possibilities for the existence of life in these planetary systems. The book also posits a taxonomic classification of the various forms of life that might be found, including speculation on the relative abundance of different forms and the generic fate of living systems. The fate and future of life on Earth will also be considered. The closing passages address the Fermi Paradox, and conclude with philosophical reflections on the possible place of Homo sapiens in the potentially vast stream of life across the galaxies.

Planetary atmospheres are complex and evolving entities, as mankind is rapidly coming to realise whilst attempting to understand, forecast and mitigate human-induced climate change. In the Solar System, our neighbours Venus and Mars provide striking examples of two endpoints of planetary evolution, runaway greenhouse and loss of atmosphere to space. The variety of extra-solar planets brings a wider angle to the issue: from scorching "hot jupiters" to ocean worlds, exo-atmospheres explore many configurations unknown in the Solar System, such as iron clouds, silicate rains, extreme plate tectonics, and steam volcanoes. Exoplanetary atmospheres have recently become accessible to observations. This book puts our own climate in the wider context of the trials and tribulations of planetary atmospheres. Based on cutting-edge research, it uses a grand tour of the atmospheres of other planets to shine a new light on our own atmosphere, and its relation with life.

A reconceptualization of origins research that exploits a modern understanding of non-covalent molecular forces that stabilize living prokaryotic cells. Scientific research into the origins of life remains exploratory and speculative. Science has no definitive answer to the biggest questions--"What is life?" and "How did life begin on earth?" In this book, Jan Spitzer reconceptualizes origins research by exploiting a modern understanding of non-covalent molecular forces and covalent bond formation--a physicochemical approach propounded originally by Linus Pauling and Max Delbrück. Spitzer develops the Pauling-Delbrück premise as a physicochemical jigsaw puzzle that identifies key stages in life's emergence, from the formation of first oceans, tidal sediments, and proto-biofilms to progenotes, proto-cells and the first cellular organisms.

Investigating the latest research questions in astrobiology, this volume will fascinate a wide interdisciplinary audience at all levels.

The amazing science behind the search for Earth-like planets Ever since Carl Sagan first predicted that extraterrestrial civilizations must number in the millions, the search for life on other planets has gripped our imagination. Is Earth so rare that advanced life forms like us—or even the simplest biological organisms—are unique to the universe? How to Find a Habitable Planet describes how scientists are testing Sagan's prediction, and demonstrates why Earth may not be so rare after all. James Kasting has worked closely with NASA in its mission to detect habitable worlds outside our solar system, and in this book he introduces readers to the advanced methodologies being used in this extraordinary quest. He addresses the compelling questions that planetary scientists grapple with today: What exactly makes a planet habitable? What are the signatures of life astronomers should look for when they scan the heavens for habitable worlds? In providing answers, Kasting explains why Earth has remained habitable

despite a substantial rise in solar luminosity over time, and why our neighbors, Venus and Mars, haven't. If other Earth-sized planets endowed with enough water and carbon are out there, he argues, chances are good that some of those planets sustain life. Kasting describes the efforts under way to find them, and predicts that future discoveries will profoundly alter our view of the universe and our place in it. This book is a must-read for anyone who has ever dreamed of finding other planets like ours—and perhaps even life like ours—in the cosmos. In a new afterword, Kasting presents some recent breakthroughs in the search for exoplanets and discusses the challenges facing space programs in the near future.

This book explains why scientists believe that life may be more common in the Universe than previously considered possible. It presents the tools and strategies astronomers and astrobiologists are using in their formal search for habitable exoplanets as well as more advanced forms of life in other parts of our galaxy. The author then summarizes what is currently known about how and where organic molecules critical to our form of carbon-based life are manufactured. The core of the book explains (and presents educated guesses) how nervous systems evolved on Earth, how they work, and how they might work on other worlds. Combining his knowledge of neuroscience, computers, and astrobiology the author jumps into the discussion whether biological nervous systems are just the first step in the rise of intelligence in the Universe. The book ends with a description from both the psychologist’s and the neuroscientist’s viewpoints, exactly what it is about the fields of astrobiology and astronomy that “boggles the minds” of many amateur astronomers and interested non-scientists. This book stands out from other popular science books on astrobiology by making the point that “astro-neurobiologists” need to begin thinking about how alien nervous systems might work.

Discusses the possibility of different forms of life than ours within our solar system and in other solar systems too.

Barrie Jones addresses the question "are we alone?", which is one of the most frequently asked questions by scientists and non-scientists alike. In The Search for Life Continued, this question is addressed scientifically, and the author is not afraid to include speculation. Indeed, the author believes beyond reasonable doubt that we are not alone and this belief is based firmly on frontier science of the most imaginative kind. The author concentrates on planetary systems beyond our own but starts with life on Earth, which is the only life we know to exist, and which provides guidance on how best to search for life elsewhere. Planets are the most likely abode of life and so we start the quest with the search for planets beyond the Solar System – exoplanets. The methods of searching are outlined and the nature of hundreds of exoplanetary systems so far discovered described. In the near future we expect to discover habitable Earth-like planets. But are they actually inhabited? How could we tell? All will be revealed. This full color book is written for everybody who wants to stay in close contact with the latest on possible life on other planets.

Approaches from the sciences, philosophy and theology, including the emerging field of astrobiology, can provide fresh perspectives to the age-old question 'What is Life?'. Has the secret of life been unveiled and is it nothing more than physical chemistry? Modern philosophers will ask if we can even define life at all, as we still don't know much about its origins here on Earth. Others regard life as something that cannot simply be reduced to just physics and chemistry, while biologists emphasize the historical component intrinsic to life on Earth. How can theology constructively interpret scientific findings? Can it contribute constructively to scientific discussions? Written for a broad interdisciplinary audience, this probing volume discusses life, intelligence and more against the background of contemporary biology and the wider contexts of astrobiology and cosmology. It also considers the challenging implications for science and theology if extraterrestrial life is discovered in the future.

Does life exist on other planets? This 1998 book presents the scientific basis for thinking there

may be life elsewhere in the Universe. It is the first to cover the entire breadth of recent exciting discoveries, including the discovery of planets around other stars and the possibility of fossil life in meteorites from Mars. Suitable for the general reader, this authoritative book avoids technical jargon and is well illustrated throughout. It covers all the major topics, including the origin and early history of life on Earth, the environmental conditions necessary for life to exist, the possibility that life might exist elsewhere in our Solar System, the occurrence of planets around other stars and their habitability, and the possibility of intelligent extraterrestrial life. For all those interested in understanding the scientific evidence for and likelihood of extraterrestrial life, this is the most comprehensive and readable book to date.
The search for life in the solar system and beyond has to date been governed by a model based on what we know about life on Earth (terran life). Most of NASA's mission planning is focused on locations where liquid water is possible and emphasizes searches for structures that resemble cells in terran organisms. It is possible, however, that life exists that is based on chemical reactions that do not involve carbon compounds, that occurs in solvents other than water, or that involves oxidation-reduction reactions without oxygen gas. To assist NASA incorporate this possibility in its efforts to search for life, the NRC was asked to carry out a study to evaluate whether nonstandard biochemistry might support life in solar system and conceivable extrasolar environments, and to define areas to guide research in this area. This book presents an exploration of a limited set of hypothetical chemistries of life, a review of current knowledge concerning key questions or hypotheses about nonterran life, and suggestions for future research.
In Origins of Existence astrophysicist Fred Adams takes a radically different approach from the long tradition of biologists and spiritual leaders who have tried to explain how the universe supports the development of life. He argues that life followed naturally from the laws of physics -- which were established as the universe burst into existence at the big bang. Those elegant laws drove the formation of galaxies, stars, and planets -- including some like our Earth. That chain of creation produced all the tiny chemical structures and vast celestial landscapes required for life. Ultimately, physical laws and the complexity they generate define the kind of biospheres that are possible -- from an Amazon rain forest to a frigid ocean beneath an ice sheet on a Jovian moon. Adams suggests that life was not merely some lucky break, but rather a natural outcome of the ascending ladder of complexity supported by our universe. Since our galaxy seems to harbor millions of planets with the same basic elements of habitability as Earth, the emergence of life is probably not a rare event. If life emerges deep inside planets and moons, as new research suggests happened on our planet, the number of viable habitats is truly enormous. Seven chronological chapters take the reader from the laws of physics and birth of the universe to the origins of life on Earth -- showing how energy flowed, exploded, and was repeatedly harnessed in replicating structures and organisms. In his groundbreaking first book, Fred Adams established the five eras of the universe with a focus on its long-term future. It is perhaps not surprising that he now turns his attention to the mystery of our astronomical origins. Here is a stunning new perspective, a book of genesis for our time, revealing how the laws of physics created galaxies, stars, planets, and even life in the universe.
This book provides concise and cutting-edge reviews in astrobiology, a young and still emerging multidisciplinary field of science that addresses the fundamental questions of how life originated and diversified on Earth, whether life exists beyond Earth, and what is the future for life on Earth. Readers will find coverage of the latest understanding of a wide range of fascinating topics, including, for example, solar system formation, the origins of life, the history of Earth as revealed by geology, the evolution of intelligence on Earth, the implications of genome data, insights from extremophile research, and the possible existence of life on other planets within and beyond the solar system. Each chapter contains a brief summary of the current status of the topic under discussion, sufficient references to enable more detailed

study, and descriptions of recent findings and forthcoming missions or anticipated research. Written by leading experts in astronomy, planetary science, geoscience, chemistry, biology, and physics, this insightful and thought-provoking book will appeal to all students and scientists who are interested in life and space.

The past few years have seen an incredible explosion in our knowledge of the universe. Since its 2009 launch, the Kepler satellite has discovered more than two thousand exoplanets, or planets outside our solar system. More exoplanets are being discovered all the time, and even more remarkable than the sheer number of exoplanets is their variety. In Exoplanets, astronomer Michael Summers and physicist James Trefil explore these remarkable recent discoveries: planets revolving around pulsars, planets made of diamond, planets that are mostly water, and numerous rogue planets wandering through the emptiness of space. This captivating book reveals the latest discoveries and argues that the incredible richness and complexity we are finding necessitates a change in our questions and mental paradigms. In short, we have to change how we think about the universe and our place in it, because it is stranger and more interesting than we could have imagined.

"Planetary Astrobiology provides an accessible, interdisciplinary gateway to the frontiers of knowledge in astrobiology via results from the exploration of our own solar system and exoplanetary systems"--

An insider's look at the cutting-edge science of today's planet hunters In Strange New Worlds, renowned astronomer Ray Jayawardhana brings news from the front lines of the epic quest to find planets—and alien life—beyond our solar system. Only in the past two decades, after millennia of speculation, have astronomers begun to discover planets around other stars—thousands in fact. Now they are closer than ever to unraveling distant twins of the Earth. In this book, Jayawardhana vividly recounts the stories of the scientists and the remarkable breakthroughs that have ushered in this extraordinary age of exploration. He describes the latest findings--including his own—that are challenging our view of the cosmos and casting new light on the origins and evolution of planets and planetary systems. He reveals how technology is rapidly advancing to support direct observations of Jupiter-like gas giants and super-Earths—rocky planets with several times the mass of our own planet—and how astronomers use biomarkers to seek possible life on other worlds. Strange New Worlds provides an insider's look at the cutting-edge science of today's planet hunters, our prospects for discovering alien life, and the debates and controversies at the forefront of extrasolar-planet research. In a new afterword, Jayawardhana explains some of the most recent developments as we search for the first clues of life on other planets.

An argument that we have a moral duty to explore other planets and solar systems--because human life on Earth has an expiration date. Inevitably, life on Earth will come to an end, whether by climate disaster, cataclysmic war, or the death of the sun in a few billion years. To avoid extinction, we will have to find a new home planet, perhaps even a new solar system, to inhabit. In this provocative and fascinating book, Christopher Mason argues that we have a moral duty to do just that. As the only species aware that life on Earth has an expiration date, we have a responsibility to act as the shepherd of life-forms--not only for our species but for all species on which we depend and for those still to come (by accidental or designed evolution). Mason argues that the same capacity for ingenuity that has enabled us to build rockets and land on other planets can be applied to redesigning biology so that we can sustainably inhabit those planets. And he lays out a 500-year plan for undertaking the massively ambitious project of reengineering human genetics for life on other worlds. As

they are today, our frail human bodies could never survive travel to another habitable planet. Mason describes the toll that long-term space travel took on astronaut Scott Kelly, who returned from a year on the International Space Station with changes to his blood, bones, and genes. Mason proposes a ten-phase, 500-year program that would engineer the genome so that humans can tolerate the extreme environments of outer space--with the ultimate goal of achieving human settlement of new solar systems. He lays out a roadmap of which solar systems to visit first, and merges biotechnology, philosophy, and genetics to offer an unparalleled vision of the universe to come.

Astronomer Peter Linde takes the reader through the story of the search for extraterrestrial life in a captivating and thought-provoking way, specifically addressing the new research that is currently devoted towards discovering other planets with life. He discusses the methods used to detect possible signals from other civilizations and the ways that the space sciences are changing as a result of this new field. “Are we alone?” is a mystery that has forever fascinated mankind, gaining momentum by scientists since the 1995 discovery of the existence of exoplanets began to inspire new ways of thinking in astronomy. Here, Linde tries to answer many philosophical questions that derive from this area of research: Is humanity facing a change of paradigm, that we are not unique as intelligent beings? Is it possible to communicate with others out there, and even if we can—should we?

This book aims at providing a brief but broad overview of biosignatures. The topics addressed range from prebiotic signatures in extraterrestrial materials to the signatures characterising extant life as well as fossilised life, biosignatures related to space, and space flight instrumentation to detect biosignatures either in situ or from orbit. The book ends with philosophical reflections on the implications of life elsewhere. In the 15 chapters written by an interdisciplinary team of experts, it provides both detailed explanations on the nature of biosignatures as well as useful case studies showing how they are used and identified in ancient rocks, for example. One case study addresses the controversial finding of traces of fossil life in a meteorite from Mars. The book will be of interest not only to astrobiologists but also to terrestrial paleontologists as well as any reader interested in the prospects of finding a second example of life on another planet.

Kaufman details the incredible true story of science's search for the beginnings of life on Earth and the probability that it exists elsewhere in the universe.

Offering an engaging and complete story of the hunt for new worlds, this volume fully details the detection and exploration of extrasolar planets. It examines the very wide range of extrasolar planets that have been discovered during the past ten years and looks at what can be learned about such planets by studying the bodies in our own solar system. It also discusses the formation of planetary systems, the way in which such systems may evolve and the final systems of planets that result. In addition, the authors demonstrate how life might evolve on an extrasolar planet and how such life might be detected.

In Assembling Life, David Deamer addresses questions that are the cutting edge of research on the origin of life. For instance, how did non-living organic compounds assemble into the first forms of primitive cellular life? What was the source of those compounds and the energy that produced the first nucleic acids? Did life begin in the ocean or in fresh water on terrestrial land masses? Could life have begun on Mars? The book provides an overview of conditions on the early Earth four billion years ago and explains why fresh water hot springs are a plausible alternative to salty seawater as a site where life can begin. Deamer describes his studies of organic compounds that were likely to be available in the prebiotic environment and the volcanic conditions that can drive chemical evolution toward the origin of life. The book is not exclusively Earth-centric, but instead considers whether life could begin elsewhere in our solar system. Deamer does not propose how life did begin, because we can never know that with certainty. Instead, his goal is to understand how life can begin on any habitable planet, with Earth so far being the only known example.

A quantitative introduction to the Solar System and planetary systems science for advanced undergraduate students, this engaging new textbook explains the wide variety of physical, chemical and geological processes that govern the motions and properties of planets. The authors provide an overview of our current knowledge and discuss some of the unanswered questions at the forefront of research in planetary science and astrobiology today. They combine knowledge of the Solar System and the properties of extrasolar planets with astrophysical observations of ongoing star and planet formation, offering a comprehensive model for understanding the origin of planetary systems. The book concludes with an introduction to the fundamental properties of living organisms and the relationship that life has to its host planet. With more than 200 exercises to help students learn how to apply the concepts covered, this textbook is ideal for a one-semester or two-quarter course for undergraduate students.

Introduces a broad range of scientific and philosophical issues about life through the original historical and contemporary sources.

Is the Earth the right model and the only universal key to understand habitability, the origin and maintenance of life? Are we able to detect life elsewhere in the universe by the existing techniques and by the upcoming space missions? This book tries to give answers by focusing on environmental properties, which are playing a major role in influencing planetary surfaces or the interior of planets and satellites. The book gives insights into the nature of planets or satellites and their potential to harbor life. Different scientific disciplines are searching for the clues to classify planetary bodies as a habitable object and what kind of instruments and what kind of space exploration missions are necessary to detect life. Results from model calculations, field studies and from laboratory studies in planetary simulation facilities will help to elucidate if some of the planets and satellites in our solar system as well as in extra-solar systems are potentially habitable for life.

Panspermia is the concept that life can be passively transported through space on various bodies and seed, habitable planets and moons, which we are beginning to learn may exist in large numbers. It is an old idea, but not popular with those who prefer that life on Earth started on Earth, an alternative, also unproven hypothesis. This book updates the concept of

panspermia in the light of new evidence on planet formation, molecular clouds, solar system motions, supernovae ejection mechanisms, etc. Thus, it is to be a book about newly understood prospects for the movement of life through space. The novel approach presented in this book gives new insights into the panspermia theory and its connection with planetary formation and the evolution of galaxies. This offers a good starting point for future research proposals about exolife and a better perspective for empirical scrutiny of panspermia theory. Also, the key to understanding life in the universe is to understand that the planetary formation process is convolved with the evolution of stellar systems in their galactic environment. The book provides the synthesis of all these elements and give the readers an up-to-date insight on how panspermia might fit into the big picture.

Learn the secrets of planet-hunters as they search for planets beyond our solar system. Is there more to a star than meets the eye? Take a trip to an alien world and encounter wobbling stars, frozen moons, and boiling oceans. Stunning illustrations and cutting-edge science make this book a first in the field. Includes a glossary and index.

College Ruled Color Paperback. Size: 6 inches x 9 inches. 55 sheets (110 pages for writing). Find New Planets For Future And For Life. 157492750347

With increasing frequency, scientists are finding evidence that planets and moons throughout the universe could be hospitable to life. Nearly 1,800 planets orbiting stars other than the sun have been confirmed since 1995, including more than 700 in February alone. Scientists now conclude that the Milky Way galaxy alone contains a trillion planets, and many believe microbial life, if not intelligent life, exists beyond Earth. Still, finding extraterrestrial life poses enormous challenges. Adequate instruments for observation and sufficient scientific understanding don't yet exist to determine whether distant planets -- or even potentially habitable moons in our own solar system -- harbor life. Moreover, scientists are split on whether sending robots or humans to explore distant worlds is more effective. The biggest challenge for space science, however, may be Washington budget-cutting, which has made it difficult to ensure stable, long-term funding for large scientific projects.

The Secret of the Ninth Planet (Chinese edition)

This thought-provoking book looks at the nature of red dwarf systems as potential homes for life. Realistically, what are the prospects for life on these distant worlds? Could life evolve and survive there? How do these planetary surfaces and geologies evolve? How would life on a planet orbiting a red dwarf differ from life on Earth? And what are the implications for finding further habitable worlds in our galaxy? The author provides readers with insight into the habitability of planets and how this changes as time progresses and the central star evolves. Since the previous 2013 edition Under a Crimson Sun, there has been a rise in newly discovered planets orbiting red dwarfs, accompanied by controversial areas of research that test what we think we know about these systems. This revised edition delves into the wealth of new material uncovered since that date. It explains the often conflicting results and analyses put forward and clarifies our understanding of these exciting new worlds. The chapters explore the full width of relevant scientific discovery and speculation on the potential for red dwarf planets to host life. New content includes improved atmospheric models, new understandings of the impact of stellar radiation on the atmosphere of red dwarf worlds, tidal-locking, and comparisons with terrestrial geology and climate.

A guide to understanding the formation of life in the Universe The revised and updated second edition of Astrobiology offers an introductory text that explores the structure of living things, the formation of the elements required for life in the Universe, the biological and geological history of the Earth, and the habitability of other planets. Written by a noted expert on the topic, the book examines many of the major conceptual foundations in astrobiology, which cover a diversity of traditional fields including chemistry, biology, geosciences, physics, and astronomy. The book explores many profound questions such as: How did life originate on Earth? How

has life persisted on Earth for over three billion years? Is there life elsewhere in the Universe? What is the future of life on Earth? Astrobiology is centered on investigating the past and future of life on Earth by looking beyond Earth to get the answers. Astrobiology links the diverse scientific fields needed to understand life on our own planet and, potentially, life beyond. This new second edition: Expands on information about the nature of astrobiology and why it is useful Contains a new chapter “What is Life?” that explores the history of attempts to understand life Contains 20% more material on the astrobiology of Mars, icy moons, the structure of life, and the habitability of planets New ‘Discussion Boxes’ to stimulate debate and thought about key questions in astrobiology New review and reflection questions for each chapter to aid learning New boxes describing the careers of astrobiologists and how they got into the subject Offers revised and updated information throughout to reflect the latest advances in the field Written for students of life sciences, physics, astronomy and related disciplines, the updated edition of Astrobiology is an essential introductory text that includes recent advances to this dynamic field.

Over the past ten years, the discovery of extrasolar planets has opened a new field of astronomy, and this area of research is rapidly growing, from both the observational and theoretical point of view. The presence of many giant exoplanets in the close vicinity of their star shows that these newly discovered planetary systems are very different from the solar system. New theoretical models are being developed in order to understand their formation scenarios, and new observational methods are being implemented to increase the sensitivity of exoplanet detections. In the present book, the authors address the question of planetary systems from all aspects. Starting from the facts (the detection of more than 300 extraterrestrial planets), they first describe the various methods used for these discoveries and propose a synthetic analysis of their global properties. They then consider the observations of young stars and circumstellar disks and address the case of the solar system as a specific example, different from the newly discovered systems. Then the study of planetary systems and of exoplanets is presented from a more theoretical point of view. The book ends with an outlook to future astronomical projects, and a description of the search for life on exoplanets. This book addresses students and researchers who wish to better understand this newly expanding field of research.

This is a book on planets: Solar system planets and dwarf planets. And planets outside our solar system – exoplanets. How did they form? What types of planets are there and what do they have in common? How do they differ? What do we know about their atmospheres – if they have one? What are the conditions for life and on which planets may they be met? And what’s the origin of life on Earth and how did it form? You will understand how rare the solar system, the Earth and hence life is. This is also a book on stars. The first and second generation of stars in the Universe. But in particular also on the link between planets and stars – brown dwarfs. Their atmospheric properties and similarities with giant exoplanets. All these fascinating questions will be answered in a non-technical manner. But those of you who want to know a bit more may look up the relevant mathematical relationships in appendices.

Astrobiology involves the study of the origin and history of life on Earth, planets

and moons where life may have arisen, and the search for extraterrestrial life. It combines the sciences of biology, chemistry, palaeontology, geology, planetary physics and astronomy. This textbook brings together world experts in each of these disciplines to provide the most comprehensive coverage of the field currently available. Topics cover the origin and evolution of life on Earth, the geological, physical and chemical conditions in which life might arise and the detection of extraterrestrial life on other planets and moons. The book also covers the history of our ideas on extraterrestrial life and the origin of life, as well as the ethical, philosophical and educational issues raised by astrobiology. Written to be accessible to students from diverse backgrounds, this text will be welcomed by advanced undergraduates and graduates who are taking astrobiology courses.

Knoll explores the deep history of life from its origins on a young planet to the incredible Cambrian explosion, with the very latest discoveries in paleontology integrated with emerging insights from molecular biology and earth system science. 100 illustrations.

Are we alone in the universe? Are the planets our playground to treat as we will, or do we have a responsibility to other creatures who may inhabit or use them? Do we have a right to dump trash in space or leave vehicles on Mars or the moon? How should we interact with other life forms? Encountering Life in the Universe examines the intersection of scientific research and society to further explore the ethics of how to behave in a universe where much is unknown. Taking contributions from notable experts in several fields, the editors skillfully introduce and develop a broad look at the moral questions facing humans on Earth and beyond. Major advances in biology, biotechnology, and medicine create an urgency to ethical considerations in those fields. Astrobiology goes on to debate how we might behave as we explore new worlds, or create new life in the laboratory, or interact with extraterrestrial life forms. Stimulated by new technologies for scientific exploration on and off the Earth, astrobiology is establishing itself as a distinct scientific endeavor. In what way can established philosophies provide guidance for the new frontiers opened by astrobiology research? Can the foundations of ethics and moral philosophy help answer questions about modifying other planets? Or about how to conduct experiments to create life in the lab or about? How to interact with organisms we might discover on another world? While we wait for the first echo that might indicate life beyond Earth, astobiologists, along with philosophers, theologians, artists, and the general public, are exploring how we might behave—even before we know for sure they are there. Encountering Life in the Universe is a remarkable resource for such philosophical challenges.

A trio of editors [Professors from Austria, Germany and Israel] present Life on Earth and other Planetary Bodies. The contributors are from twenty various countries and present their research on life here as well as the possibility for extraterrestrial life. This volume covers concepts such as life’s origin, hypothesis

of Panspermia and of life possibility in the Cosmos. The topic of extraterrestrial life is currently ‘hot’ and the object of several congresses and conferences. While the diversity of “normal” biota is well known, life on the edge of the extremophiles is more limited and less distributed. Other subjects discussed are Astrobiology with the frozen worlds of Mars, Europa and Titan where extant or extinct microbial life may exist in subsurface oceans; conditions on icy Mars with its saline, alkaline, and liquid water which has been recently discovered; chances of habitable Earth-like [or the terrestrial analogues] exoplanets; and SETI’s search for extraterrestrial Intelligence.

Extrasolar Planets The Search for New Worlds Stuart Clark There have recently been many exciting developments in the search for planetary-sized bodies orbiting Sun-like stars. This book provides a timely, readable, yet comprehensive overview of this fast moving field. It presents the very latest discoveries and ideas, and covers the wealth of new and important observational data. An increasing number of suspected planets outside our own Solar System are now being found, and many objects have been independently confirmed. Surprisingly, the extrasolar planets discovered so far display orbital properties more diverse than those found in the Solar System. The implication of these discoveries for theories of planet formation and the possibilities of life elsewhere makes this an exciting and important field. In Extrasolar Planets, Stuart Clark discusses the formation and evolution of stars, and the processes leading to the formation of protoplanetary discs, planetesimals, embryonic planets and complete planetary systems. He describes in detail the various techniques currently being employed for the detection of extrasolar planets, and the results of searches to date. The author reviews the evidence for all suspected extrasolar planets, and discusses the theoretical problems posed by giant planets with small orbital radii and those in highly eccentric orbits. Brown dwarfs and possible planets around pulsars are also explored. The 'habitable zone' is described in the context of extrasolar planets which might support life, and the book discusses future planned searches for extrasolar planets, including those designed to detect Earth-sized worlds. Readership: Undergraduate and postgraduate students of astronomy, astrophysics, planetary sciences, life sciences, space science, physics, biophysics and theoretical physics, and professional researchers in these fields. Amateur astronomers and non-specialists having an interest in planetary science in general and extrasolar planets in particular.